Small Business Innovation Research/Small Business Tech Transfer

Non-Iridium X-Ray Coatings for Lynx and other Future Missions, Phase I

Completed Technology Project (2018 - 2019)

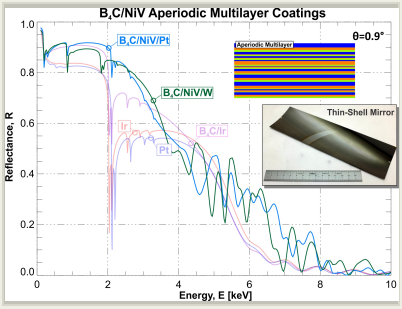
Project Introduction

The proposed research is directed at the development of new optical interference coatings having low film stress and high reflectance in the X-ray band from 0.1 to 10 keV, which are critically needed for the construction of lightweight, nested X-ray telescopes having high collecting area and sub-arcsecond resolution for Lynx, the high-energy flagship mission under consideration for the 2020 Astrophysics Decadal Survey, as well as for other future NASA X-ray missions. Iridium-based coatings provide high reflectance over the Lynx energy band, however such films also have exceedingly high stress, and film stress deforms thin-shell mirror substrates, thereby degrading telescope angular resolution. The proposed effort aims to develop low-stress, high-X-ray-reflectance optical interference coatings for Lynx, using in place of iridium (Ir) either platinum or tungsten layers, in combination with layers of various light elements. These non-Ir interference coatings have the potential for lower stress and higher reflectance than Ir coatings, thus enabling the realization of lightweight X-ray telescopes having high collecting area and sub-arcsecond angular resolution.

Anticipated Benefits

The low-stress, high-reflectance X-ray coatings that we propose to develop are critically needed for the construction of light-weight X-ray telescopes having sub-arcsecond angular resolution, as required for NASA's Lynx mission now under consideration for the 2020 Astrophysics Decadal Survey, and for other future missions as well.

The new X-ray coatings potentially can be used to develop high-resolution X-ray optics for a variety of other applications outside of space science, including instruments for next-generation light sources (FELs, etc), plasma physics, atto-second physics, and others.



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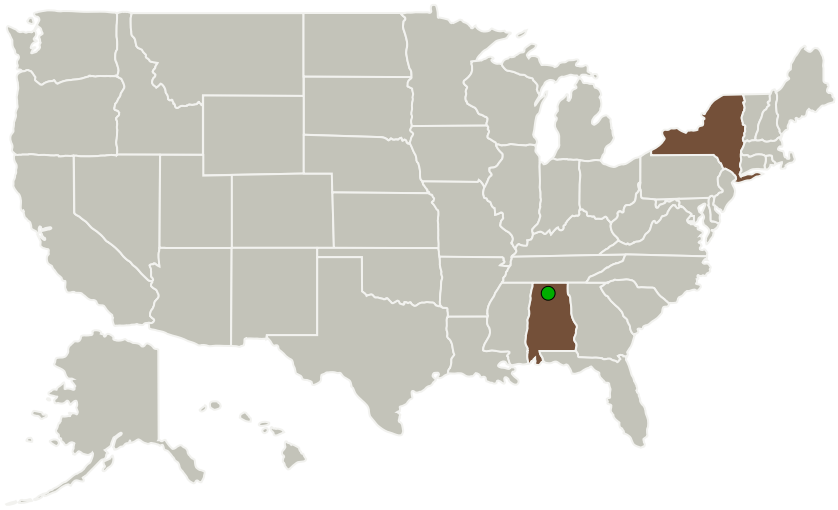
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Reflective X-Ray Optics LLC	Lead Organization	Industry	New York, New York
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	New York

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137876)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Reflective X-Ray Optics LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

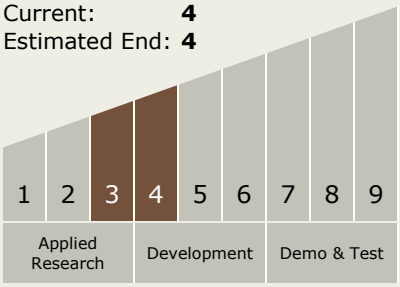
Carlos Torrez

Principal Investigator:

David L Windt

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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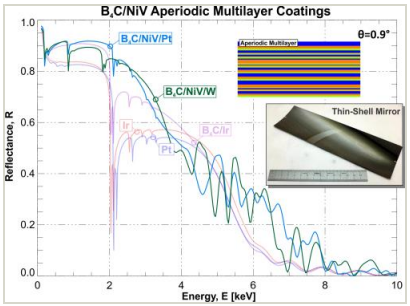
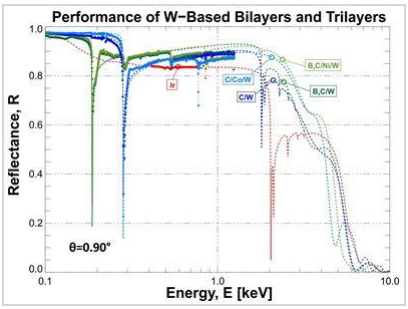
Images



Briefing Chart Image
Non-Iridium X-Ray Coatings for Lynx and other Future Missions, Phase I
(https://techport.nasa.gov/image/128742)



Final Summary Chart Image
Non-Iridium X-Ray Coatings for Lynx and other Future Missions, Phase I
(https://techport.nasa.gov/image/125854)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems

Target Destination

Outside the Solar System